

The references have been corrected in the specification.

Item 4b.

The chemical formulas have been modified throughout the specification where required.

Item 4c.

The spelling of hydroxyl has been corrected.

Item 4d.

The parenthesis have been closed.

Item 4e.

Passage 70 has been appropriately re-numbered as passage 20.

Item 6a.

The paragraphs pointed out by the examiner in item 6 have been modified in the specification in order to correct these objections.

Item 6b.

The paragraph has been corrected.

Item 6c.

The paragraphs pointed out by the examiner in item 6 have been modified in the specification in order to correct these objections.

Item 7.

Section 7: 112 enablement rejections:

hydrophilic organic solvent is disclosed on page 28 line 12-14, page 29 line 5 and page 28 line 7-11:

"Water is also a solvent used in some cases. Water may be used with this

formulation as an alternative to part of the organic solvents in certain formulations. Water may not work as well because it would compete with water in the wood unless a slower reaction was desired.

Other solvents include any water compatible organic solvents such as dioxane.

(Acetone) is also a good carrier for non-glue wood composites.

(THF (Tetrahydrofuran)) works well with glues used in wood.

Poly dimethylsiloxane. May be used as an additive to boron compounds to result in the silicon and boron compounds.

Alcohols (Methanol or ethanol work particularly well)."

Item 8.

Exothermic is shown on page 22 line 13 and page 23 line 5-9.

"Heat from the reaction will add pressure which will increase the saturation. The release of pressure and heat will indicate a completed reaction."

"...heat and pressure generated by the reaction, for example, between the methyl trichlorosilane. could build. When the pressure drops, indicating that the heat generated by the reaction is ended or after a set period time if the wood is not to fully be treated, then the wood would be taken out of the solution."

Also see page 22 lines 4-6.

Item 9.

The solute being monomeric is shown on page 29 line 1 and 2; page 28 line 3-4 and line 12.

"In some cases the solvent and additive may react in order to form a gel and in some cases it might be useful to agitate the solution in order to prevent that.

SOLVENT: The solvent can vary tremendously also although it is preferably a non water based solvent so as not to cause a reaction or minimal water compound so it is not going to cause. It would typically be structured so as not to effect the glue or other properties of wood composites."

See also page 17 lines 4-12.

Item 10.

The words procatalyst and non-procatalyst do not appear in the specification as such.

However, procatalyst is defined in the claims and specification as a substance which generates an acid utilizing the following language:

"a molecule producing an acid or base in the presence of wood cellulose or water in wood cellulose."

This same language is used in claim 82 and it would be redundant to delete a procatalyst, but if necessary the inventor would suggest the following amendment to claim 82:

"82. The process of claim 81 wherein the acid is produced by a molecule producing an acid in the presence of water in wood."

Claim 83 would then be re-written as:

"83. The process of claim 82 wherein the acid is in the range of 0.1-10% of the solution."

Number 84 would then read:

"84. The process of claim 83 wherein the acid is in the range from 0.1 – 4.9 % of the solution."

Claim 86 would then read:

"86. The process of claim 82 wherein the molecule is a molecule comprised of silicon and a halogen."

87 would then be written:

"87. The process of claim 82 wherein the functional group comprises a molecule producing an acid in the presence of water in wood cellulose and a molecule which does not produce an acid in the presence of water in wood cellulose that reacts exothermically on application to wood at standard atmospheric temperature and pressure."

88 would then be written:

"88. The process of claim 82 wherein a molecule which does not produce an acid in the presence of water in wood cellulose reacts exothermically with wood in the presence of a molecule producing an acid in the presence of water in wood cellulose."

111 would then be written:

"111. A process for treating wood cellulose having a plurality of hydroxyl groups comprising the steps of:

Providing a solution comprised of a non-water-based hydrophilic organic solvent; a molecule which produces an acid in the presence of water in the wood cellulose diffused as a chemical from the solution and bonding with wood in conjunction with water in the wood and generating in the bonding a catalyst; and a molecule not producing an acid in the presence of water in wood cellulose diffused as a chemical from the solution and bonding with wood cellulose in the presence of the catalyst generated by the molecule producing an acid in the presence of water in wood cellulose."

112 would then be written:

"112. The process of claim 111 wherein the catalyst is an acid produced by the molecule which produces an acid in the presence of water in the wood cellulose is defined as a molecule producing an acid causing a spontaneous reaction of the molecule producing an acid in the presence of water in wood cellulose."

113 would then be written:

"113. The process of claim 112 wherein the acid or a molecule which produces an acid in the presence of wood cellulose is in the range of 0.1-10% of the solution."

114 would then be written:

"114. The process of claim 112 wherein the acid or a molecule which produces an acid in the presence of wood cellulose is in the range from 0.1-4.9% of the solution."

115 would then be written:

"115. The process of claim 112 wherein the acid is selected from the group consisting of acids from alkyl-silicon halides, acids from alkyl-hilade monomers with trivalent, tetravalent and pentavalent atoms, hydrochloric, meta-phosphoric acid, poly-phosphoric acid, and Phosphoric acid and combinations thereof, wherein the acid is in the range of 0.01-10% *in situ*."

116 would then be written:

"116. The process of claim 112 wherein a molecule which produces an acid in the presence of water in wood cellulose is a molecule comprised of silicone and a halogen."

117 would then be written:

"117. The process of claim 112 wherein a molecule which does not produce an acid in the presence of water in wood cellulose reacts exothermically and spontaneously with wood in

the presence of a molecule which does produce an acid in the presence of water in the wood cellulose."

118 would then be written:

"118. The process of claim 112 wherein the molecule which does not produce acid in the presence of water in the wood cellulose would include hydroxyl and alkoxy bonded tetravalent atoms."

Although as discussed above, procatalyst and non-procatalyst are terms which are defined in the claims and in the specifications sufficiently as to not add new matter, they may be taken out of the claims as shown in order to clarify this for the purpose of satisfying any possible rejection which the examiner might have to the inclusion of terms which are fully defined in the specification.

Procatalyst and non-procatalysts as used in the claims are taught on page 15 line 18, page 17 line 4-12 (including a limitation of .5-5%), page 19 line 17-22, page 20 line 9-12 (disclosing a limit of .1-10%), original claims 34-36 and 38-43 which are added to the specification by amendment). ["Creating an acid which can further catalyze the reaction."]

"Figure 7 shows the suspected chemical process disclosed by the specification. In Figure 7, methyl trichloro silane is used as a reactant or catalyst (as discussed in more detail below in reference to Figures 13 and 14). There are "n" molecules of the catalyst which react with "n" molecules of H₂O present in the wood to yield "n" times 3 HCl molecules providing an acid environment for catalyzing the reaction of the silicate with the hydroxyl group. This reaction draws the reactants into the wood and allows for a greater penetration of the wood of the treatment. Aside from generating the acid environment, the silicate is converted to a hydroxyl form 30 (postulated) which forms a chain as shown at 32

which in proximity to the hydroxyl groups coming off of the cellulose ring units 34 reacts to form the silicate structure.

"Boron may be added as boric acid to the formula effectively in the range of .5 to 5% and is trapped in the silicone matrix. Alternatively, a reactive boron reagent of the type discussed above may be used to form a boron matrix such as that disclosed in Figure 10 when used in conjunction with a reactive silicate.

"The acid catalyst could even be in the range of 0.01 to 10%. The 10% figure is pushing the reaction as a 10% additive would not be a catalyst but would be an environmental change. A base catalyst may also be employed, but is less effective within the same range. Examples are metal alkoxides [eg.sodium methoxide] Ammonia, Organic bases [eg. Triethylamine]."

Item 11.

Acid reducing compounds are taught on page 34 lines 10- 11.

"At any point the reagents may be drained through a valve in a drain 5 and other chemicals, such as acid neutralizing agent may be added to wash or treat the wood."

And on page 27 lines 12-15:

"If, in a reaction, hydrochloric acid is released it would preferably be diluted, degraded (neutralized), or otherwise removed during or after the treatment process to prevent the degradation of the wood or irritation caused by the slow release of this acid to the environment. It could, for example, be converted to environmentally safe and natural salts."

The claims (100 and 101) have been amended to replace "acid reducing compound" with "acid neutralizing agent" in order to be consistent with the specific words used in the specification.

Item 12

Solvation by water is shown on page 5 line 13-15, page 6 line 10-11, page 9 line 17, page 15 line 13-15, page 17 line 6-10, page 23 line 2, page 26 line 10-13 and page 22 line 2-3 specifically referring to the reactants being **hydrolized by water in the wood. In the '165 patent this is also shown on page 10 line 2-3.**

"Because "WPTC" is drawn into the wood through a molecular reaction, it actually works faster on a "green" piece of wood. This is due to the fact that the chemical reaction of "WPTC" is accelerated by the reaction or mixture with water

"natural liquids of the wood to literally "pull" the chemical into the wood

"The chemical itself reacts very strongly with liquids.

"Creating an acid during a reaction with the cellulose or water within the wood

" n " molecules of the catalyst which react with " n " molecules of H₂O present in the wood to yield " n " times 3 HCl molecules providing an acid environment for catalyzing the reaction of the silicate with the hydroxyl group. This reaction draws the reactants into the wood and allows for a greater penetration of the wood of the treatment.

"The reaction is enhanced by water within the wood.

T"rimethylborate [TMB]. This reagent reacts with water/mixture within wood to undergo partial or full hydrolysis to polyborates or boric acid respectively. (See Figures 8, 9 and 10). It could react after partial hydrolysis with methyltrihydroxysilane to form mixed boron and silicon polymers as shown.

"As shown in Figure 10, the MCl_3Si and boron has hydrolized to produce $MSi(OH)_3$ and $B(OH)_3$.

"Though the molecular change that occurs in the treatment process changes some of the molecular components of the wood, it does not change the structural character of the wood."

Item 13

The cyclic structure referred to is clearly shown on page 16 line 10-22, page 17 lines 1-3 and in figures 6a-6c. It is also shown in claims (original) 34-36 and 38-43 which have been added to the specification by amendment.

"Figure 6A shows a less likely structure for the molecular bonding where the cellulose in the preferred embodiment may contain, by exposure within the disclosure to silicone and boron reactant molecules and solutions, a limited replacement of the hydroxyl groups with boron and silicone becoming a part of the silicone chain. It is therefore one product which is claimed by the invention which is a cellulose chain modified to have bonded between hydroxyl oxygen atoms 23 boron atoms 24, silicone atoms 25 or other hydrophobic or anti-degrading elements. As can be seen by reference to Figure 6A, these silicone atoms are preferably silicone atoms which have alkyl groups 26 attached to form alkyl silicates. It is taught that these alkyl groups may be varied according to the disclosure set forth below or may be replaced altogether."

"As can best be seen by reference to Figure 6B, the expected end product involves the binding across the hydroxyl groups of the cellulose rings 37 of atoms or molecules (here boron or alkyl silicates) with the outer valence shells being competed across Oxygen

molecules 40 between the atoms or molecules. Figure 6B also shows how it is possible that the binding would be less organized than that suggested in Figure 6a and that there may be binding across more than one hydroxyl group in a single cellulose molecule within a chain of repeating units (shown again in Figure 6c as n repeating units.)"

Item 14

The procatalysts are shown on page 15 line 18, page 17 line 4-12 (showing an acid content of .5-5%), page 19 line 17-22 and page 20 line 1-3. It is also shown in the original claims 34-36 and 38-43 which are incorporated into the specification by this amendment.

"creating an acid which can further catalyze the reaction"

"“n” molecules of the catalyst which react with “n” molecules of H₂O present in the wood to yield “n” times 3 HCl molecules providing an acid environment for catalyzing the reaction of the silicate with the hydroxyl group. This reaction draws the reactants into the wood and allows for a greater penetration of the wood of the treatment. Aside from generating the acid environment, the silicate is converted to a hydroxyl form 30 (postulated) which forms a chain as shown at 32 which in proximity to the hydroxyl groups coming off of the cellulose ring units 34 reacts to form the silicate structure.

"Boron may be added as boric acid to the formula effectively in the range of .5 to 5% and is trapped in the silicone matrix. Alternatively, a reactive boron reagent of the type discussed above may be used to form a boron matrix such as that disclosed in Figure 10 when used in conjunction with a reactive silicate.

"In this structure, the acid is in very low concentration (in the case of methyl trichloro silane approximately .5%) to the silicone main donor, in this case octyltrimethoxysilane (MTS) or it's equivalent. This is significant for many reasons, not the least of which are

the limitation of the acidity of the end products, the minimization of expensive reactants, the safety of the solution and the lack of toxic emissions.

Since water in the solution is particularly excluded or limited p. 28 line 12-14, all of the water driven reactions are seen to occur by reaction with water within the wood p.15 line 13-14; p. 17 line 6-12 and 23 line 2 for example.

"Water is also a solvent used in some cases. Water may be used with this formulation as an alternative to part of the organic solvents in certain formulations. Water may not work as well because it would compete with water in the wood unless a slower reaction was desired"

"creating an acid during a reaction with the cellulose or water within the wood."

"“n” molecules of the catalyst which react with “n” molecules of H₂O present in the wood to yield “n” times 3 HCl molecules providing an acid environment for catalyzing the reaction of the silicate with the hydroxyl group. This reaction draws the reactants into the wood and allows for a greater penetration of the wood of the treatment. Aside from generating the acid environment, the silicate is converted to a hydroxyl form 30 (postulated) which forms a chain as shown at 32 which in proximity to the hydroxyl groups coming off of the cellulose ring units 34 reacts to form the silicate structure."

"The reaction is enhanced by water within the wood."

PRIOR ART REJECTIONS

Introduction

Each of the independent claims, recite common elements, for example:

1 hydrophilic organic solvents

2 non-oligomerized (monomer) reactants

- 3 covalently bonding the solute compound to the hydroxyl groups of the wood cellulose, and
4. bonding molecules of said solute compound to one another.

Additionally recited claim elements may include:

5. spontaneous, exothermic reaction without adding heat;
6. alignment of the bonding atoms with the wood cellulose matrix during the bonding process;
7. the use of catalysts (created in situ in the wood cellulose) for driving the reaction.

Applicant claims are distinguished over each of the cited documents individually and in combination. Traverse in this regard is presented in detail below. Thus, Applicant respectively submits that none of the cited documents whether considered individually or in combination disclose, teach, suggest or motivate Applicant claimed invention which utilizes a hydrophilic organic solvent in which the claimed solute is exposed to the wood cellulose where reaction does not occur outside of the wood (does not create stable oligomers outside of the wood) and wherein said solute exothermically reacts with the hydroxyl groups of the wood cellulose forming covalent bonds and wherein said solute molecules also covalently react with one another.

Thus, Applicant submits that the claimed invention is not anticipated and is not obvious over the cited documents. Applicant respectfully requests that all rejections under 35 U.S.C. 102 and 103 be withdrawn.

To elaborate, the cited documents exemplify different methods of creating non-reactive solutions (for example; stable "cured" oligomers and oxygenated polymers,

such as, SiO_2) which require supplemental heat or other destabilizing energy to infuse a treatment into the wood. In contrast, Applicant's claimed invention specifies that the claimed solution uses an exothermic reaction to covalently bond the claimed compound with the hydroxyl groups of the wood. Applicant's claimed hydrophilic solution is readily adsorbed by the wood. Applicant's claimed process is safe for the wood and does not require endothermic energy as disclosed by the technologies of the cited documents.

Applicant's claimed invention does not require pores in the wood of the type required by hydrophobic silicone formulations which are available as emulsions or slurry. Applicant's claimed invention recites a solution which penetrates wood through migration from a solvent into the wood and reacts with wood cellulose (as well as other of the claimed compound molecules). Applicant's asserts that none of the cited documents disclose treatments that would form permanent bonding of applicant's claimed compound to the interior and surface of the wood (or wood products), spontaneously, by contact.

Applicant's claimed invention is also distinguished by incorporating a soluble boron reagent to the formulas that would react with wood cellulose and lignins in a manner similar to silicon; thus forming a silicon-boron matrix in the wood further contributing to termite protection and fire retardancy. The cited document infused unreacted boron acids into the wood without fixing those in the wood using a covalently bonded shield.

Applicant's solvents are non-reacting. They are non-reactive hydrophilic solvents to allow penetration of reactive reagents to deep within (i.e. interior) of both wet and dry wood.

Exposure of wood to neat MTS may be dangerous due to excessive formation of gaseous hydrochloric acid that may hurt handlers and may degrade wood. Exposure to neat trimethylborate may result in excessive drawing in of moisture by the treated wood from the environment because the *hygroscopic conditions that would exist*

Applicants claimed invention is distinguished over the use of the non-hydrophilic solvents (such as gas and benzene). The cited documents do not disclose Applicants claimed invention. Such disclosures teach away from Applicant's invention since protection of the wood is the desired end result.

The rejection of the claims based on Saka JP08-318509 states that the use of an acid catalyst (p.14,16) is disclosed. The present patent discloses something which is quite different.

Experimental data shows that the acid used in the reaction of Saka does not work without the addition of heat. The ability to obtain an exothermic reaction, one that generates heat which is disclosed throughout the Kelsoe application is where the present invention differs.

It's clear in from the entire paragraph in Saka that the hydrolyzation that Saka is considering catalyzing is hydrolyzation of the metal ions and not the bonding process that is taking place in Kelsoe. Even if one were to reinterpret Saka to be something other than it is, Saka does not teach exothermic bonding of the tetravalent atoms which is the cornerstone of the Kelsoe claims under consideration.

Saka, clearly an expert with all of the prior art in front of him, by his own omission, including his own invention which clearly he was aware of missed the Kelsoe method. In fact, the very existence of the disclosure in Saka, without taking the inventive

step to form an exothermic reaction is the best evidence that the claimed method in Kelsoe is not obvious.

Applicant's Response To Rejections Under 35 U.S.C. 103:

Introduction

Each of the independent claims, recite one or of the following elements, for example:

1. hydrophilic organic solvents
2. non-oligomerized (monomer) reactants
3. covalently bonding the solute compound to the hydroxyl groups of the wood cellulose, and
4. bonding molecules of said solute compound to one another.
5. exothermic reaction using a catalyst;
6. alignment of the bonding atoms with the wood cellulose matrix during the bonding process ;

7. the use of strong acid catalysts for driving the reaction.
8. the use of in situ generation of strong acids using water in the wood.

The prior art does not teach or suggest stable oligomers in the solute which exothermically react with the hydroxyl groups of the wood cellulose forming covalent bonds and wherein the solute molecules also covalently bond with one another.

Thus, Applicant submits that the claimed invention is not anticipated and is not obvious over the cited documents. Applicant respectfully requests that all rejections under 35 U.S.C. 102 and 103 be withdrawn.

To elaborate, the cited documents exemplify different methods of creating non-reactive solutions (for example; stable "cured" oligomers and oxygenated polymers,

such as, SiO₂) which require supplemental heat or other destabilizing energy to infuse a treatment into the wood.

In contrast, Applicant's claimed invention specifies that the claimed solution uses an exothermic reaction to covalently bond the claimed compound with the hydroxyl groups of the wood. Applicant's claimed process is safe for the wood and does not require endothermic energy as disclosed by the technologies of the cited documents.

On page 14 of the 8-318509 reference Saka discloses the following:

... "Next, the wooden material which has become impregnated with the metal alkoxide is dried within a temperature range which is unaccompanied by pyrolysis with the metal alkoxide preferably within a range of 50-110°C. It is during the process that the metal alkoxide becomes hydrolyzed or pyrolyzed and then polycondensed resulting in it's conversion into a metal oxide. Said metaloxide may, however, become easily solubilized and desorbed under the pervasion of water. . . Such an elution, however, can be prevented by concomitantly using the hydrolyzable alkoxy silyl group- containing organosilicone compound. The hydrolyzing process may be implemented by using an acid catalyst, alkaline catalyst, or a catalyst mixture . . ."

Concomitantly means at the same time.

"After the hydrolyzable alkoxy silyl group containing organosilicate compound represented by the formula 2 has been added to a composite precursor solution which includes, 1, 2, or more types of the aforementioned metal alkoxide with fire proof effects, a humidified wood and material is then impregnated with the obtained mixture..."(p. 13) This disclosure is then followed with the language "**and subsequently** said metal alkoxide (s) is hydrolyzed or pyrolyzed and then polycondensed, as a result of which a metal oxide is

generated and the wooden material is dried." (p.13)

This clearly shows that Saka, while he may have seen an acid catalyst being involved in the reaction, did not see the importance of adding an acid catalyst in advance of the treatment.

This is followed with examples where acids are not mentioned except for acetic acid.

Test results show that weak acid such as acetic acid taught in the quantities taught have no effect on hydrolyzation.

One other item worth a look is that the organosilicon is identified on page 11 as follows:

"A compound represented by the following general formula is desirable as the hydrolyzable alkoxy silyl group-containing organosilicon compound to be used in the present invention: $R_m(Si)(OR)_{4-m}$."

R is then identified as a "substituted or non-substituted monovalent hydrocarbon group which contains 1-18, preferably 1-12 carbon atoms and examples include alkyl groups" [and a long list of others]. The substitution of halogen for hydrogens is suggested, although typographically misnamed.

Saka was clearly at the height of expertise, had thoroughly investigated the prior art by his own admission, (p. 7 of Saka) but failed to realize that his process could be modified to provide a result which provided exothermic bonding with greater efficiency, greater functionality and at lower cost. Saka concentrated on the use of trace amounts (experimentally 1% (page 16) and by disclosure (page 3) in the range of .0001 to .5 mole) of organosilicon reactants. In this regard he taught that the organosilicon would not be the primary reactant. Because of this, the organosilicon is overwhelmed even in

the presence of an acid catalyst. Saka also teaches the use of large amounts of water in his patent and in actually raises the content of water to 25% in the wood to achieve a result which is non-exothermic.

Saka teaches that heat is necessary to have a reaction with the chemicals used.

Saka actually points one skilled in the art away from carrying out the reaction exothermically.

Also, Saka's experiments all required the use of highly complex and expensive reagents and preparations which are eliminated by defining a specific exothermic reactant process.

Because acid catalysts do not work with Saka's embodiments without the addition of heat, Saka does not support the use of a strong acid as catalyst. His mention of an acid catalyst in the context of his experiments, would encourage a developer away from learning that an exothermic reaction using strong acid was possible.

There is no specific mention of using a strong acid, or particularly HCl prior to the infusion of chemicals on Saka. This omission leads one skilled in the art without a specific reactant which would allow the to be carried out exothermically.

In addition, Saka conditions the wood to a high water content (25%) which he does in order to obtain a sol gel. While this is not a counterproductive product and yields the types of polymers which are desired by Saka, it is counter-productive and interferes with exothermically reacting with wood silicon using the Kelsoe method.

Contrasts between Saka and Kelsoe are striking. The first is the way in which wood, before being treated in Saka's examples, are subjected to conditioning that is

exotic and complex and which are required to get an effective reaction using the Saka method.

The Saka approach is treatment by displacement. Little or no chemical reaction takes place within the wood prior to oven heating, only placement of reacted oligomer within the wood structures with no chemical bonding. Contrast that with the Kelsoe approach that uses the reaction to obtain infusion and bonding. Here the reaction of monomer within the wood allows the reaction to initiate and go to completion using cellulose in the wood as one of the reactants.

In summary, the teachings of Saka teach away from and fail to teach the following key elements:

Saka	Kelsoe
<ul style="list-style-type: none">1) Adds chemicals to wood and then reacts using heat and pressure.2) Saka pretreatment undermines the use of hydrophilic organic and prevents acid catalyst. Saka conditions the wood to have a 25% content of water (p. 16).3) Fails to disclose how it would be effectively used with an acid catalyst.4) Predicts only reactions with heat added externally. Fails to teach any workable catalyst.5) Endothermic	<ul style="list-style-type: none">1) Uses an exothermic reaction to form a hydrolysis reaction with the compounds in wood. Catalyst is added before exposure to wood.2) No pre-treatment required.3) Discloses specific method of using an acid catalyst.4) Teaches a specific catalyst to make an exothermic reaction. The use of a strong acid (particularly HCl)5) Exothermic

The premise of Saka in 509 revolves around what he describes as an in-organic wood composite. He describes the quantity of alkoxy silanes as "minuscule", so it is unclear what role "coupling" is to his overall concept.

Kelsoe's use of strong acids (both Lewis and Brønsted types) These acids

speed up the reactions of the alkoxy silane to the cellulose by assisting in bond cleaving and bond formation (specifically H and OH units). As in Saka's method, some esterification of the alcohol/acid solution might occur, but the predominate result would be in the form of a catalytic function.

Saka mentions acidic catalysts, but doesn't mention how this "acidic catalyst" would be used, what this acidic catalyst is or what hydrolyzing process it implements. Nor does it say when this process would be implemented except that he does do his hydrolyzation after (subsequent) to introducing it to the wood of reactants. Since the only acid mentioned before a reaction and described is acetic acid, petitioner would allege that unless acetic acid in the embodiments shown would catalyze the reaction of the Kelsoe patent (which experimental data shows does not occur); then the Saka disclosure is inadequate. Saka requires extensive pre-treatment and post treatment application of heat and pressure to work.

The claims as presented state that Kelsoe has achieved a reaction which experimental data shows is exothermic and fully treats without heat or pressure. In addition, it treats more completely than Saka (See, In re Fenn (1981, Cust & Pat App) 639 F2d 762, 208 USPQ 470)[surprising lack of swelling of diaphragm made with asbestos fibers and resin according to claimed method as compared with closest prior art overcomes *prima facie* obviousness case established by PTO].

Clearly a self-initiating reaction would be unobvious given the fact that Saka admits to an extensive investigation of the prior art without finding or disclosing or even postulating an exothermic process.

To say that patentee conceived a mere aggregation with no new results is equivalent to saying that his achievement would have been obvious as a whole to a person having ordinary skill in art to which it pertained. There is no such teaching in the prior art.

Blaw-Knox Co. v I. D. Lain Co. (1956, CA7 Ill) 230 F2d 373, 108 USPQ 356. A combination providing new and unobvious results is patentable. Brown v Brock (1957, CA4 Md) 240 F2d 723, 112 USPQ 199.

Saka does not state how acid would be used to catalyze the reaction and does not teach that it would eliminate the need for heat and pressure. A method of use of the catalyst prior to infusion of the reactants would have to be determined from the other disclosure or else it would have to be determined on the basis of some prior art which would render it obvious. Even Saka failed to see this could be done. Validity of combination patent is not limited to new function accomplished, but extends to co-operation of elements claimed to produce a new result that markedly improves over art. Jamesbury Corp. v Litton Industrial Products, Inc. (1978, CA2 Conn) 586 F2d 917, 199 USPQ 641, cert den (1979) 440 US 961, 59 L Ed 2d 774, 99 S Ct 1503, 201 USPQ 960.

Saka does not state how acid would be used to "exothermically" catalyze the reaction and does not teach that it would eliminate the need for heat and pressure and extension pre-treatment. The nature of and the method of use of the "acidic catalyst" would have to be determined from the other disclosure or else it would have to be determined on the basis of some prior art which would render it obvious. Obvious and nonobvious combinations of prior art elements are distinguished on basis of whether surprising or synergistic results are achieved. Parker v Motorola, Inc. (1975, CA5 Fla) 524 F2d 518, 188 USPQ 225, reh den (1976, CA5 Fla) 526 F2d 1407 and cert den (1976) 425 US 975, 48 L Ed 2d 799, 96 S Ct 2175, 190 USPQ 172, reh den (1976) 427 US 908, 49 L Ed 2d 1200, 96 S Ct 3194. Further, No unusual or surprising results are required unless the patent merely combines old elements. Austin v Marco Dental Products, Inc. (1977, CA9 Or) 560 F2d 966, 195 USPQ 529, cert den (1978) 435 US 918, 55 L Ed 2d 511, 98 S Ct 1477, 197 USPQ 448. Here new elements, a strong acid in a stable treatment solution without pre-

treatment is taught only by the Kelsoe disclosure.

The inventor would submit that because Saka requires heat and pressure in every instance of his invention in order to provide a reaction after the application of the elements, that no obvious use of acid could be derived from the disclosure Saka for the methods taught by Kelsoe.

For a showing of "unexpected results" to be probative evidence of non-obviousness, applicant for patent must at least establish that (1) there actually is difference between results obtained through claimed invention and those of prior art, and (2) such difference would not have been expected by one skilled in art at time of invention. In re Freeman (1973, Cust & Pat App) 474 F2d 1318, 177 USPQ 139; In re Juillard (1973, Cust & Pat App) 476 F2d 1380, 177 USPQ 570. The test results clearly shows that the type of improvement necessary to support the patent.

In the present case, the invention discloses the application of a catalyst which causes a reaction which is further described in the claims as being an acid catalyst and is further described as three particular types of acids or a compound yielding those acids in solution such as trimethylchloride which is specifically claimed. The pro-catalyst is added to the solution prior to the treatment of the wood with the solution.

None of the prior art describes the process which incorporates these steps, although the prior art does allude to the use of an unidentified "acidic catalyst" in order to catalyze reaction, but no specific applications affecting this are taught in such a way enable them to be practiced without heat and pressure post application treatment.

There is also no showing that the teachings of the prior art lead to the implementation of a process incorporating the steps which are set forth or that the novel benefits which are set out in the specification would result.

A patent will be held valid where unexpected operating characteristics or combination of old elements form the subject of the patent. United States v Adams (1966) 383 US 39, 15 L Ed 2d 572, 86 S Ct 708, 148 USPQ 479.

Omission of elements of a combination, without retaining its function, was not invention; but if an element did not contribute to success of combination, but prevented or defeated it, omission of such element could have been invention. Hardinge Bros., Inc. v Marr Oil Heat Mach.Corp. 27 F2d 779 (1928, CA7 III).

It is instructive in order to review those issues dealt with during the interview in order to view the importance of experimental results.

The first issue raised by the examiner was the use of hydrophilic organic solvents.

It was pointed out that the organic solvents were disclosed clearly in the specification and it was also specifically disclosed in the specification that water may not work as well because it will compete with the water in the wood unless a slower reaction was desired. Saka pretreats to add water content.

The patent disclosure on the issue of heat generation has been cited above.

The petitioner is able to show several instances where the stability of the chemicals of Kelsoe prior to application to the wood cellulose was shown. In particular, it was shown in Figure 2 and in the description of Figure 7.

It was pointed out that the description of Figure 7 starting on line 4 page 17 stated that in molecules of catalysts react within molecules of H_2O (present in the wood) to yield $nX_3 HCl$ molecules providing an environment for catalyzing the reaction of the silicate with the hydroxyl groups. The disclosure states (Item 9 in 165) that chains are only formed after reaction of the cellulose chain.

The same paragraph also teaches that the silicate is converted to a hydroxyl form which forms a chain. This clearly shows that the reaction is occurring within the wood, something not taught in Saka.

Figure 11 and the description of Figure 11 on page 18 starting on line 5.(of the 642 patent) describes the same mechanism: "in the presence of an acid or an acid generated by the trimethylchlorosilane gives a more complex molecule where the silicate is combined along with carbon atoms of cellulose as opposed to the hydroxyl groups as shown at B3." It also bears mentioning that this is repeated throughout the specification and in other locations including in the original claims.

The examiner has questioned the use of the word "procatalyst" in the claims, and it is pointed out that the particular claim objection could be easily dealt with just by cancelling out the language in claim 82 "a procatalyst defined as" since the rest of claim 82 did the defining as "a molecule producing an acid or a base in the presence of wood cellulose or water with cellulose."

It is taught in Kelsoe (642) on page 18 lines 23 of the specification, that the acid had to be "a strong acid (hydrochloric, phosphoric, or sulfuric) directly or by way of a catalyst yielding the acid in solution with the water in the wood such as methyltrichlorosilane (CH_3SiCl_3)."

Acetic acid, a known weak acid, is ineffective. The petitioner stated that the specification could be limited to just certain acids which are strong acids or even the disclosed acid combinations. This differentiated the Kelsoe application from the use of acetic acid with subsequent hydrolyzation which the inventor's experiments show does not work exothermically.

The Kelsoe application is patentable because it teaches an effective exothermic catalyst being added to the solution prior to the application of the solution to the wood cellulose, something never cited in any prior art document. Also Kelsoe teaches the catalyst is a substance which effects the exothermic reaction of the functional group wherein the functional group binds from tetravalent atoms across an oxygen of the cellulose hydroxyl group.

The examiner specifically required in the election that a specific solute be identified for examination. There is a very specific definition of solute which uses a tetravalent atom with an alkoxy functional group and a strong acid catalyst added to the solution prior to the application to wood.

The inventors in the Saka case state "the present inventors compiled exhausted research in order to achieve the aforementioned objective" beginning on page 7 and ending on page 8 which shows that the methods specifically taught by the Kelsoe application was not obvious after a thorough investigation of the prior art.

Saka states... "and **subsequently** said metal alkoxide (s) is hydrolyzed or pyrolyzed and then polycondensed, as a result of which a metal oxide is generated and the wooden material is dried." This clearly shows that Saka, did not see the importance of adding an acid catalyst to initiate heat generating wood - silane reaction.

Continuing on with the descriptions given in Saka, and also showing the differences between Saka and the exothermic reaction which has been accomplished in the instant specification. Saka states that on page 13 "said wood material may be immersed in a metal alkoxide solution which the aforementioned organosilicone compound represented by the formula 2 has been added, or the reduced or elevated - pressure dispensing method may be used instead"(p14). At this point in time Saka has clearly shown that he is using the absorption qualities of the wood and not any reaction in order to get the chemical into the wood. Saka continues "next, the wood material which has thus become impregnated with the metal alkoxide is dried within a temperature range which is unaccompanied by the pyrolysis of the metal alkoxide, preferably within a range of 50-110 degrees. It is during this process that the metal alkoxide has become hydrolyzed or pyrolyzed and then polycondensed, resulting in its conversion to a metal oxide.

There is no suggestion that acid catalyzation should occur contemporaneously with the addition of the organosilicone compound which is the key difference between the

invention of Kelsoe and the invention of Saka and the reason why Kelsoe can use an exothermic reaction.

Clearly the examiner would have to stretch Saka beyond the breaking point to say that Saka foresaw a process which would prevent the metal alkoxide added by Saka from entering the wood.

Also, Saka does not teach any way in order to use an acid to do exothermic reactions and hence one would have to assume that any specific methods of using an acid in order to catalyze the reaction would be unobvious in light of the fact that Saka's exhausted research failed to result in even one examples of how to use it.

Applicant respectfully submits that there is no anticipation, that the rejection is improper and should be withdrawn.

JP8-318509 (Kokai) is discussed in more detail here and above, Sake and Kokai fail to disclose a method of using strong acids in order to generate an exothermic reaction despite the prior art.

Kokai (509) doesn't' disclose the use of halogenated alkyl silanes or hydrochloric acid nor hydrochloric acid produced on contact with wood. The fact there are not halogenated silanes of any kind.

Distinguishing JP8-318509 to Kokai in View of Meyers "3,682,675"

The Myers patent relates to the flame retardency of wood products, and in particular wood panels. The flame retardency is preferably accomplished by immersing the panel to be treated in a hot solution, and I the presence of compressional energy. However, there is apparently no discussion in Myers regarding the mechanism by which the treating agent interacts with the wood panel, except that is infused. In addition,

because Myers is relying upon the addition of supplemental heat and compressional energy it seems unlikely that if any reaction is occurring in the Myers' process, that it is exothermic. Thus, Myers does not expressly disclose the claimed exothermic process in which compounds (molecules) are cross linked via the hydroxyl groups of the cellulose. Further, the Examiner has provided no technical explanation as to why the heated infusion process disclosed by Myers would be either exothermic or involve replacement of the hydroxyl groups of the cellulose.

Applicant claims the use of the chemicals covalently bonded with wood cellulose and water within the wood in order to take the un-reacted Cellulose and react them creating acid as a part of the reaction, which is optionally catalyzed utilizing acid in conjunction with the claimed compound in order to have the cellulose react within the wood generating an exothermic reaction which is self-sustaining and facilitates deep penetration of the chemicals then would be possible without the addition of pressure and heat as is taught by the cited documents. The use of undiluted catalyst (such as methyltrichlorosilane), damages the wood when used on or leaves undesirable damaging concentrations of acid or other chemicals which may leach back into the environment.

In view of the above, Applicant respectfully submits that no *prima facie* case of obviousness has been established and requests withdrawal of the instant rejection.

Distinguishing JP8-318509 to Kokai in View of Ogiso "3,682,675"

The Ogiso publication describes a study involving ultrasonic radiation treatment used in the preparation of moisture conditioned composites. The ultrasonic radiation allegedly enhances the absorption of the treating agent, i.e., SiO₂ (pp 302, first

paragraph), and the resulting SiO₂ gel formed in the wood. In contrast, in applicant's claimed invention, the compounds being added are not absorbed for the purpose of forming a gel. As discussed above, applicant's invention involves an exothermic process, a process that proceeds via in situ generated heat, in which the claimed compounds (molecules) react with wood cellulose so they are cross-linked to the wood cellulose through one or more of the hydroxyl groups on the wood cellulose.

Distinguishing JP8-318509 to Kokai in View of Saka "5,652,026"

In U.S. Patent 5,652,026 to Saka *et al.*, the disclosure technology treats wood with a methylsiloxane oligomer which contains phosphorous and/or boron. These are high molecular weight co-polymers that need to be prepared separately from trialkoxysilanes and other reagents by heating and diluting. The material to be applied on to wood is not an alkyltrialkoxysilane but a pre-prepared copolymer. Saka does not disclose Applicant's claimed composition.

The wood to be treated by the Saka treatment is moisture conditioned first by soxhlet extraction with acetone, a very expensive procedure followed by exposure to moisture to the desired water content. This conditioned wood is then dipped for three days in the oligomer formula in methanol under vacuum. Essentially the oligomer is forced to be drawn in to the pores of wood by mechanically applied vacuum and the methanol is simultaneously removed. The wood then undergoes heat treatment at 65 degrees for one day and then at 105 degrees for another day. This wood had a weight gain of 11.3%; however on exposure to water for four hours more than one half of the silicon (7.5%) was leached out indicating that the silicon is not bonded to the wood in

spite of prolonged and expensive curing of the wood at high temperatures after treatment.

Saka's technology of using the silicon oligomers followed by curing the wood at high temperatures to obtain fire retardency is not related to the Fossil Rock technology as described above.

Applicant's the '642 application is unexpected, new and novel. For example if one evaluate the make-up of the reacting formula of the sol-gel technology with wood vs. the reacting formula of the '642 application there are no similarities at all.

Saka's disclosure is a mixture of un-reactive gel comprising of oligomers made soluble in an aqueous medium (SOL-GEL formula).

Sakas treatment is un-reactive on contact with wood.

Saka's disclosed technology is based upon **SOL-GEL** technology. The term SOL-GEL refers to

1. Making a gel like substance of undefined chemical composition by hydrolyzing a mixture of boron, silicon and phosphorous reagents with water which is a mixed oligomer, in a reaction vessel outside the vicinity of any material to be treated.

2. The above gel is then made soluble in an aqueous organic solvent . This solution no longer contains or have any similarities with the reagents used as wood treatments in the instant patent. This is the wood treatment formula of the Gel-Sol technology of Saka.

1. The wood to be treated is separately extracted with acetone in a special complex apparatus known as the soxhlet to remove water. The wood is then dried and

exposed to moisture to get the desired moisture content for the wood to be treated.

2. The wood is then placed in a chamber and vacuum is applied for approximately three days to "evacuate" the wood
3. The evacuated wood while in vacuum is then exposed to the solubilized oligomer gel formula to have the formula enter the wood. The wood is then removed after forced impregnation under vacuum and then dried at 60 degrees.
4. No reaction has yet taken place among wood molecules and the oligomer formula.
5. The wood is then heated at 105 degrees for another 24 hours to make the reaction work at least partially. Both silicon and boron leaches out of the wood in significant amounts after pyrolysis.
6. SOL-GEL stands for Soluble Gel.

The composition of the formula consists of oligomers of polysiloxanes prepared from hydrolysable silicon, boron and phosphorous compounds that are treated with water and hydrolysed to oligomers of unknown composition. These mixtures of oligomers are then dissolved in methanol/water to make the formula to treat wood. Saka utilizes a mixture of oligomers in aqueous methanol prepared outside wood prior to treatment. This formula is not related to Applicant's invention.

It does not matter where the hydrolysis take place. Saka's oligomers whether outside or inside the wood are unable to react with wood molecules. The Saka gel oligomerizes under the required condition of heating for prolonged periods (24 hours at 60 degrees and another 24 hours at 105 degrees). In order for the formula to penetrate

wood of 1.0 mm thickness a vacuum must be applied for three days. In addition the wood piece must be preconditioned with soxhlet extraction and then moisture conditioned. The entire procedure is so cumbersome and expensive that in all probability will not result in profitable industrial application.

The '642 application on the other hand has a well-defined chemical formula that is completely homogeneous and stable. No expensive and time consuming (soxhlet extraction with acetone and then moisture conditioning) preconditioning of wood is needed for the reactions to occur. The formula is absorbed to ALL parts of wood by simple contact (dipping, brushing or spraying). No application of vacuum is necessary. Once absorbed and in contact with wood molecules having hydroxy groups (cellulose, lignins etc) the pro-catalyst present in Kelsoe patent formula releases hydrogen chloride in catalytic amount that in turn activates the silicon and boron additives for reaction with hydroxyl groups of wood molecule resulting in covalent bond formation. These reactions are spontaneous and exothermic as opposed to the highly endothermic conditions required for the SAKA technology. Once the catalyst is released on contact with hydroxyl groups of wood molecules, the Kelsoe formula is self activated to initiate a chain reaction that eventually results in the covalent bonding of both boron and silicon to wood molecules. Therefore the boron and silicon are not leached out as experimentally verified in the specification section of the Kelsoe application.

The Saka method that relies on the Sol-Gel procedure is of theoretical interest but it is useless as a profitable and viable method for wood treatment in the lumber industry. Saka method teaches impregnation of a gel prepared separately outside the

wood, by hydrolyzing a hydrolysable silicon compound with or without addition of hydrolysable phosphorous or boron compound to form un-reactive mixed gels of undefined composition. This gel is then dissolved again outside the wood to be treated in a mixture of methanol water. Therefore the Saka formula is a solution of an un-reactive mixed gel of unknown composition. The Kelsoe formula is a crystal clear solution the composition of which is well defined and which on contact with wet or dry wood results in spontaneous and instant mild exothermic reaction to render wood simultaneous hydrophobicity, fire retardancy and microbial resistance.

Applicant's claimed invention is a stable crystal clear solution consisting of a pro-catalyst and a catalytically activatable silicon reagent with or without an appropriate boron additive. A pro-catalyst is compound forming an acid when exposed to water as taught. The demand in the present invention is exposure to hydroxyl groups of various wood molecules on contact. A catalytically activatable reagent is a reagent that is unreactive unless activated by the catalyst. In the present invention a mineral acid is produced in situ on instant contact with wood molecule that in turn activates the boron and silicon additives for instant reaction with wood molecules to form covalent bonds.

The pro-catalyst used in the instant formula is methyltrichlorosilane that on contact with hydroxyl groups will generate a strong mineral acid that in turn will activate the silicon and boron additives for instant covalent bond formation with wood molecules via the hydroxyl oxygen. Nowhere in the cited up on prior art there is a technology with the instant formation of a catalyst from a pro-catalyst that in turn will activate unreactive silicon and boron additives for instant reaction with wood molecule on contact to provide hydrophobicity, fire retardancy and microbial resistance. This expert

resoectfully submit that the Kelsoe technology is new, novel and unexpected and is patentable over the prior art teachings

Different from the Saka procedure which requires evacuation of conditioned wood for three days at 15mm/Hg, Applicant's invention penetrates both wet and dry wood on contact (dipping, spraying or brushing) and instantly reacts with wood to impart the desired properties. For these reason alone this expert respectfully submit that the Kelsoe composition to treat wood is patentable over the sol-gel procedures of Saka.

Applicant's invention imparts hydrophobicity, fire-retardancy and microbial resistance to both wet and dry wood just by contact. This unprecedented property is built in to the formula by careful theoretical design. Once the formula comes in contact with wood molecules having hydroxyl groups the pro-catalyst instantly reacts with hydroxy groups generating a mineral acid exothermically that protonates the alkoxy groups of the silicon additive and boron additive. The mineral acid does not escape the wood as gas because of its relative small amounts and the large amount of additives to be protonated. Protonation of the alkoxy groups of the additives activate them for instant reaction with wood hydroxy molecules that results on covalent bond formation of silicon and boron atoms with the oxygen atoms of the wood permanently.

The entire wood is thus treated permanently in one step, no pre-treatment, no external heat. Therefore from a mechanistic point alone the technology is novel, new and unprecedented. The composition claims recited in the Kelsoe application are patentable over the cited documents taught in SAKA patents.

Saka discloses the beginning with methyl cellulose or oxygenated cellulose or oxygenated boron gels, which are readily dissolvable utilizing organic solvents which

can be injected into wood and may react with the wood utilizing high temperature and along with the possible use of acids in order to enhance the reaction.

This process occurs external to the wood and its cellulose which is ultimately treated with the dissolved gel.

Differently, the present application teaches the use of chemicals which are applied to the wood and utilizing a catalyst in the form of acid or a reactant such as a halogenated compound such as methyltrichlorosilane that are reacted in order to get the intermediary oxygenated cellulose which then immediately reacts with the hydroxide groups and the cellulose in order to polymerize the oxygen and silicon atoms in order to form chains directly on the wood cellulose.

The dramatic and non-obvious result is that instead of having to utilize energy in order to generate the reaction, the reaction itself is self propagating and will in fact generate a limited controlled heat until the entire wood is treated or until the cellulose or compounds are used up.

Instead of requiring that the oxygenated chemicals be pushed into the wood under pressure leading to imperfect or irregular saturation, the reaction pulls in the chemicals as fuel for the chemical reaction so that penetration may be obtained at a much deeper more even level.

Hence, one reason for using hydrophilic organic solvents is in order to prevent the oxygenation of the chemicals until they come in contact with the water within the wood. Hence, while similar individual chemicals may be found in both processes, the utilization of the chemicals is so diametrically apposed as to create the difference between an endothermic and an exothermic chemical reaction.

Since penetration, even treatment and energy conservation are primary goals in wood treatment, it becomes clear that the current process was not obvious in the disclosures of the cited documents or it would have been disclosed in the manner taught in the present invention.

The use of an exothermic reaction in order to combine silanes and boron to wood cellulose does not appear to be disclosed previously.

The Court of Appeals for the Federal Circuit has long held that it is impermissible to use the claimed invention as an instruction manual or template to piece together the teachings of the prior art so that the claimed invention is rendered obvious. The Court of Appeals for the Federal Circuit has made it clear, the prior art must teach the desirability for the modification. The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification. In re Fritch, 972 F.2d 1260, 23 U.S.P.Q. 2d 1780 (Fed. Circ. 1992), citing In re Gordon et al., 733 F.2d 900, 221 U.S.P.Q. 1125, (Fed. Cir. 1984).

The subject matter of claims may not be considered obvious as a result of a hypothetical combination of references unless something in the references suggests that an advantage may be derived from combining their teachings. In this respect, the Court of Appeals for the Federal Circuit (hereinafter CAFC) has confirmed this point in In re Fritch, 972 F.2d 1260, 23 U.S.P.Q. 2d 1780 (Fed. Circ. 1992). The CAFC has clearly and consistently established the following mandate regarding hypothetical combinations of references:

Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under 35 U.S.C. 103, teachings of references can be combined only if there is some suggestion or incentive to do so. ACS Hosp. Systems, Inc. v. Montefiore Hosp., 732 F.2d 1572, 221 U.S.P.Q. 929 (Fed. Cir. 1984).

The CAFC has held that an Examiner should not rely upon hindsight to arrive at a determination of obviousness. It is impermissible to use the claimed invention as an instruction manual or template to piece together the teachings of the prior art so that the claimed invention is rendered obvious. One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. In re Fritch, 972 F.2d 1260, 23 U.S.P.Q. 2d 1780 (Fed. Circ. 1992), citing In re Fine, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596 (Fed. Cir. 1988).

In view of the above, Applicant respectfully submits that no *prima facie* case of obviousness exists. None of the cited documents, whether alone or in combination, teach or suggest all claimed elements of Applicant claimed invention. There is also no suggestion or motivation to modify or combine references to achieve Applicant claimed invention, and no reasonable expectation of success to practice Applicant claimed invention is provided. Thus, Applicant respectfully request that all of the rejections set forth under 35 U.S.C. 103 be withdrawn.

The claims have been amended to correct the 112 rejections of the examiner suggested changes to remove the use of the word pro-catalyst (see item 10).

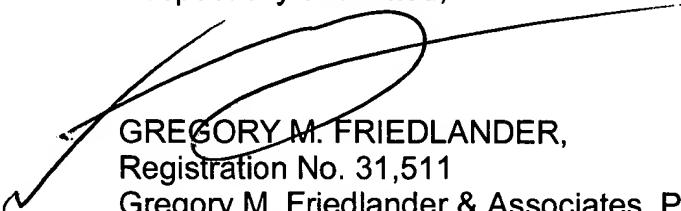
CONCLUSION:

In view of the above, Applicant respectfully submits that no *prima facie* case of anticipation or obviousness exists and that the application is in condition for allowance.

Applicant respectfully request the withdrawal of all rejections set forth under 35 U.S.C. 102 and 35 U.S.C. 103 and allowance of this application.

The commissioner is hereby authorized to charge any additional fees which may be required for this amendment, or credit any overpayment to Deposit Account 06-2129 in the name of Gregory M. Friedlander. In the event that an extension of time is required, or which may be required in addition to that requested in a petition for an extension of time, the Commissioner is requested to grant a petition for that extension of time which is required to make this response timely and is hereby authorized to charge any fee for such an extension of time or credit any overpayment for an extension of time to Deposit account 06-2129.

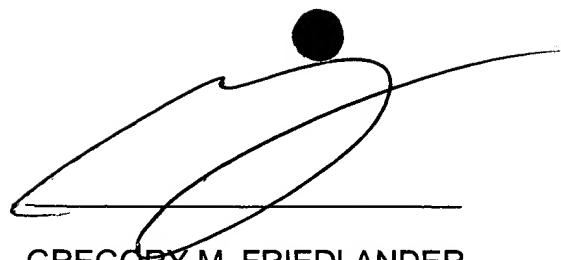
Respectfully submitted,



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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United State Postal Service as Express Mail NO. EL 781199141 US in an envelope addressed to: Commissioner of Patents and Trademarks, Box Fee Amendment, Arlington, VA 22202 on the 25 day of April, 2003.



GREGORY M. FRIEDLANDER

CLAIMS MARKED UP

72. A process for treating wood having wood cellulose having a plurality of hydroxyl groups comprising the steps of:

providing a solution consisting essentially of a non-water-based hydrophilic organic solvent and a solute having a functional group comprising an atom selected from the group consisting of trivalent, tetravalent and pentavalent atoms and combinations thereof, wherein said atom is bonded to a halogen atom or a functional group selected from the group consisting of a halogen hydroxyl group, alkoxy group, phenoxy group, benzyloxy group and an aryloxy group having a polycyclic aromatic ring and combinations thereof,

applying said solution to the wood cellulose,

covalently reacting said functional groups upon said applying to said wood.

73. The process according to claim 76 wherein the solutes are monomers and further comprising the steps of simultaneous reaction and diffusion of the monomers in the wood.

74. The invention of claim 72 wherein said reacting is exothermic.

75. The process according to claim 72 wherein the reaction is self-initiating.

76. The process of claim 72 wherein the [reactive] solute is comprised of monomers prior to application of the solute [compound] to said wood [cellulose].

77. The process of claim 72 wherein the process further comprises the step of adding a catalyst to the solution.

78. The process of claim 77 wherein the [catalyst is a substance which effects the exothermic reaction of the functional group wherein the] step of adding a catalyst further comprises the step of catalytically bonding the functional group [bonds from the trivalent,] tetravalent [or pentavalent] atom across an oxygen of the cellulose hydroxyl group.

79. The process of claim 78 wherein the catalyst is added to the wood cellulose after application of said solution to the wood cellulose.

80. The process of claim 78 wherein the catalyst is added to the solution prior to application of the solution to the wood cellulose.

81. The process of claim 78 wherein the catalyst is an acid or a base.

82. The process of claim 81 wherein the acid is produced by a [pro-catalyst defined as a] molecule producing an acid [or base] in the presence of [wood cellulose] or water in wood [cellulose].

83. The process of claim 81 or 82 wherein the acid [or procatalyst] is in the range of 0.1-

10% of the solution.

84. The process of claim 83 wherein the acid [or procatalyst] is in the range from 0.1 to 4.9% of the solution.

85. The process of claim 81 wherein the acid [is or base] is selected from the group consisting of acids from alkyl-halide monomers with trivalent, tetravalent and pentavalent atoms.

86. The process of claim 82 wherein the [pro-catalyst is a] molecule is comprised of silicon and a halogen.

87. The process of claim 82 wherein the functional group[s] comprises [pro-catalyst and non-pro-catalyst that react spontaneously on application to wood at standard atmospheric temperature and pressure] a molecule producing an acid on the presence of water in wood cellulose and a molecule which does not produce an acid in the presence of water in wood cellulose that reacts exothermically on application to wood at standard atmospheric temperature and pressure.

88. The process of claim [87] 82 wherein a molecule which does not produce an [the non-pro-catalyst functional groups react exothermically and spontaneously with wood in the presence of a pro-catalyst,] acid or base in the presence of water in wood cellulose reacts exothermically with wood in the presence of a molecule producing an acid in the presence of water in wood cellulose.

89. The process of claim 82 wherein the non-catalytic reagents would include alkyl and hydroxyl or alkoxy bonded trivalent, pentavalent and tetravalent atoms.

90. The process of claim 85 wherein the catalyst is from the group consisting of hydrochloric acid, meta-phosphoric acid, poly-phosphoric acid, bases from metal alkoxides and Phosphoric acid, and combinations thereof.

91. The process of claim 85 wherein the acid [or base generated from the catalyst] is in the range of 0.01-10% *in situ*.

92. The process of claim 72 wherein the process further comprises avoiding the formation of oligomers of the functional groups prior to applying said solution to said wood.

93. The process of claim 72 further comprising the step of:

adding at least one non-reactive additive to the wood cellulose that enhances a desired property selected from the group consisting of:

- fire resistance,
- insect resistance,
- moisture resistance
- color,
- adhesion, and
- insulation, and
- combinations thereof.

94. The process of claim 93 wherein the step of adding at least one non reactive additive further comprises adding the additive to the solution.

95. The process of claim 93 wherein the step of adding the at least one non-reactive

additive occurs before reacting the functional groups to bond with the wood cellulose.

96. The process of claim 93 wherein the additive is selected from the group consisting of:

- diatomaceous earth,
- sodium silicates,
- boron or silicon salts,
- boric acid,
- trimethyl (trialkyl) borate,
- Boron Halides (BF₃, BC₁₃, etc.),
- Boric Anhydride (boron oxide),

phosphorous compounds,
copper compounds,
metal alkoxide,
meta-phosphoric acid;
a hydrophobic reagents,
phosphoric acid, and
metaphoshoric acid,
and combinations thereof.

97. The process of claim 72 wherein the solute compound comprises functional groups selected from the group consisting of R-Xa-Xb₃, [R3-Xa-Xb, R2-Xa-Xb₂, R4-Xa, and XaR3] wherein R is [the carbon compound] an alkyl or a combination thereof, Xa is [the] a trivalent, tetravalent or pentavalent atom or a combination thereof and Xb is a halogen or alkoxy or hydroxyl group or a combination thereof.

98. The process according to claim 72, wherein the wood cellulose has an original weight and wherein the duration of treatment attains a weight of compound which is covalently bonded to the wood cellulose in a range of 0.1 to 10 weight percent of the original weight of the wood cellulose.

99. The process according to claim 72, further comprising forming cyclic interlocking molecules having as a part of the cyclic structure at least two carbons within the cellulose and at least two of the atoms from the functional groups consisting of trivalent, tetravalent and pentavalent atoms.

100. The process of claim 81 further comprising the step of exposing the acids introduced into the wood to an [acid reducing chemical] acid neutralizing agent subsequent to the treatment.

101. The process of claim 81 further comprising the step of introducing an [acid reducing chemical] acid neutralizing agent into the wood prior to the exposure of the wood cellulose to the acid.

102. The process of claim 81 further comprising the step of exposing the bases introduced into the wood to a base neutralizing compound subsequent to the exposure of the wood cellulose to the acid.

103. The process of claim 81 further comprising the step of introducing an base neutralizing chemical into the wood prior to the exposure of the wood cellulose to the base.

104. A process according to claim 72 wherein the wood cellulose is not dry and wherein the functional groups are solvated by the water in the wood prior to being covalently bonded to the hydroxyl groups of said wood cellulose.

105. The process according to claim 72 further comprising the step of adding water to the wood cellulose prior to applying the solution to the wood cellulose

106. A process for treating wood cellulose having a plurality of hydroxyl groups comprising the steps of:

providing a solution comprised of a non-water-based hydrophilic organic solvent and a solute having a plurality of monomers comprising an atom selected from the group consisting of tri-valent, tetravalent and pentavalent atoms and combinations thereof, wherein said atom is bonded to a functional group consisting of a halogen atom a hydroxyl group, alkoxy group, phenoxy group, benzyloxy group and an aryloxy group

having a polycyclic aromatic ring or combinations thereof,

applying said solution to the wood cellulose; and simultaneously diffusing said solution within said wood and
reacting said solute to form covalent bonds, and
forming a matrix structure comprising reacted monomers and wood cellulose.

107. The process of claim 106 further comprising the step of:
adding at least one non-reactive additive that enhances a desired property selected from the group consisting of:

fire resistance,
insect resistance,
moisture resistance
color,
adhesion, and
insulation, and
combinations thereof.

108. The process of claim 107 wherein the step of adding the at least one non-reactive additive occurs before covalently bonding the compound to the wood cellulose.

CANCELLED 109. The process of claim 106 further comprising the step of repeating the step of reacting said solute to form covalent bonds with other molecules of said solute in conjunction with the step of covalently bonding the molecules of the solute to the wood cellulose.

110. The process according to claim 106, further comprising a step of exposing the wood to ultra-sound sonification while applying said solution.

111. A process for treating wood cellulose having a plurality of hydroxyl groups comprising the steps of:

providing a solution comprised of a non-water-based hydrophilic organic solvent; a [pro-catalyst reactant diffused as a chemical from the solution and bonding with wood in conjunction with water in the wood and generating in the bonding a catalyst; and a non-pro-catalyst reactant diffused as a chemical from the solution and bonding with wood cellulose in the presence of the catalyst generated by the pro-catalyst] molecule which produces an acid in the presence of water in the wood cellulose diffused as a chemical from the solution and bonding with wood in conjunction with water in the wood and generating in the bonding a catalyst; and a molecule not producing an acid in the presence of water in wood cellulose diffused as a chemical from the solution and bonding with wood cellulose in the presence of the catalyst generated by the molecule producing an acid in the presence of water in wood cellulose.

112. The process of claim 111 wherein the catalyst is an acid [or base] produced by the [pro-catalyst defined as a] molecule which produces [producing] an acid [or a base causing a spontaneous reaction of the non-pro catalyst with the wood cellulose] in the presence of water in the wood cellulose is defined as a molecule producing an acid causing a spontaneous reaction of the molecule producing an acid in the presence of water in wood cellulose. [or water in wood cellulose.]

84. The process of claim 112 wherein the acid or a molecule which produces an acid in

the presence of wood cellulose [procatalyst] is in the range of 0.1-10% of the solution.

85. The process of claim 112 wherein the acid [or procatalyst] or molecule which produces an acid in the presence of wood cellulose is in the range from 0.1 to 4.9% of the solution.

86. The process of claim 112 wherein the acid [is or base] is selected from the group consisting of acids from alkyl-silicon halides, acids from alkyl-halide monomers with trivalent, tetravalent and pentavalent atoms, hydrochloric, meta-phosphoric acid, poly-phosphoric acid, [bases from metal alkoxides] and Phosphoric acid and combinations thereof,

wherein the acid [or base] is in the range of 0.01-10% *in situ*.

87. The process of claim 112 wherein [the pro-catalyst is] a molecule which produces an acid in the presence of water in wood cellulose is a molecule comprised of silicone and a halogen.

88. The process of claim 112 wherein [the non-pro-catalyst functional groups react exothermically and spontaneously with wood in the presence of a pro-catalyst] a molecule which does not produce an acid in the presence of water in wood cellulose reacts exothermically and spontaneously with wood in the presence of a molecule which does produce an acid in the presence of water in the wood cellulose.

89. The process of claim 112 wherein the [non-catalytic reagents] molecule which does not produce an acid in the presence of water in the wood



cellulose would include hydroxyl and alkoxy bonded [trivalent, pentavalent and] tetravalent atoms.